

**NASA Headquarters
Office of the Chief Engineer**

Functional Leadership Plan

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Date

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I. Introduction

This Functional Leadership Plan describes the engineering, program/project management and cross Enterprise coordination activities performed by the Office of the Chief Engineer (OCE). The Plan documents the goals, objectives, initiatives, activities, and metrics that are required to meet the customers' (Enterprises and Centers) needs.

II. Purpose/Mission

The OCE, located in the Office of the Administrator, serves as principal advisor to the Administrator and other Senior officials on matters pertaining to the execution and readiness of NASA programs/projects. Additionally, the OCE ensures that initiatives and activities are planned and conducted to enhance excellence in engineering.

The OCE has primary responsibility for the program and project management processes. Effective implementation of the processes is dependent on the Enterprises' and Centers' effective execution of the processes. To ensure focus on process execution, the OCE will work closely with the Enterprises and Systems Management Offices (SMO) at the Centers.

This Plan provides details on the implementation of these activities that support the NASA Strategic Management Handbook and the NASA Strategic Plan and reflects linkage and support to the objectives of the Strategic Plans of the Enterprises.

This Plan will be used to manage the OCE's related activities in FY 2000 and beyond. The expected benefits of the Plan are better identification of customer requirements, increased focus of the organization on common goals, and greater definition of the functional office responsibilities. It is further expected that there will be improvements in customer satisfaction as features described in the Functional Leadership Plan are implemented. This Plan is designed to be a top-level working document.

NASA uniquely spends over 80 percent of the appropriated funds on the formulation and implementation of programs and projects within programs. Because the programs and projects consume such a high percentage of the budget, NASA will be diligent in staying on the cutting edge of program and project management training, processes, and tools to enhance this very important function at NASA.

The NASA Enterprises formulate programs, and the 9 NASA Centers and the Jet Propulsion Laboratory (JPL) implement the programs. The Agency has identified four crosscutting processes (across the Enterprises and Centers) to govern all activity within the Agency. The processes are Manage Strategically, Provide Aerospace Products and Capabilities (PAPAC), Generate Knowledge, and Communicate Knowledge.

The Chief Engineer is the steward of the PAPAC process. This process is documented in the NASA Policy Directive (NPD) 7120.4 and NASA Procedures and Guidelines (NPG) 7120.5. The latter requirements document addresses the life cycle of programs

and projects and the tasks that must be accomplished to ensure the highest probability of success.

III. Goals

Principle activities of the OCE support the attainment of the following fundamental goals:

- To stimulate and enable engineering excellence,
- To oversee and improve excellence in program/project management,
- To ensure effective cross-Enterprise decisionmaking.

These goals are expanded in subsequent sections of this Plan and their associated objectives, activities, initiatives (where applicable), and metrics are provided.

IV. Engineering Excellence

Goal:

To stimulate and enable the development and advancement of a sound engineering capability necessary for success in fulfilling the challenging and ambitious goals of the NASA Enterprises.

Objective A:

Ensure continuous improvement of the NASA engineering workforce through relevant education, training, and work experiences.

Activities:

1. Coordinate with the Office of Human Resources and Education (OHRE), the Office of Equal Opportunity Programs (OEOP), the Office of Management Systems (OMS), Enterprises, Centers, and JPL in the conduct of a comprehensive assessment of the discipline and systems engineering workforce (recruitment, education, quantity, skills, training, work experience, and organization).
2. Work with OHRE, OEOP, OMS, Enterprises, Centers and JPL in devising ways to reward and recognize engineers with specific and widely recognized accomplishments in the field of systems engineering.

3. Work with OHRE, OEOP, OMS, Enterprises, Centers, and JPL and to institutionalize appropriate education and training to strengthen the engineering capability and enhance systems management.
4. Develop policy to enable the appropriate level of work to be performed in-house at the NASA Centers and JPL to ensure hands-on engineering work experience in support of the organization's core capabilities.
5. Work with academia in the development of curriculum to strengthen capabilities in the engineering of systems, advanced engineering environment, risk assessment, and cause-and-effect analysis tools and methods.

Objective B:

Ensure sound and effective discipline and systems engineering.

Activities:

1. Develop and document processes, metrics, and capability indicators with the Centers' Engineering Leadership.
2. Develop broad process, requirements and guidelines for the effective implementation of systems engineering in programs and projects.
3. Benchmark industry capability in systems engineering and the tools and methods used by successful high-technology industry for the purpose of documenting and incorporating best practices into NASA.
4. Work with Office of Safety and Mission Assurance (OSMA) to integrate the development of Risk Assessment and Management tools to support the engineering process.
5. Work with Office of Aero-Space Technology (OAST) to develop a plan for the deployment and implementation of "Design for Safety Initiative".
6. Work with the OMS to integrate the development, documentation, and incorporation of facilities engineering best practices into NASA.

Initiative:

1. Lead a coordinated Agencywide Software Systems Improvement Initiative to ensure safety, quality, and reliability in software engineering and products. Collaborate in appropriate areas with the Chief Information Officer and the OSMA.

Objective C:

Coordinate with OAST to ensure the development and implementation of the Advanced Engineering Environment (AEE) to further enable the achievement of Enterprise goals in the Faster, Better, Cheaper environment.

Activities:

1. Define AEE needs of NASA's operational and research Centers, including enabling capabilities (tools/facilities), methods, and processes.
2. Develop requirements, goals, and metrics for the AEE; define metrics and monitor progress in development and implementation with focus on the areas of greatest need.
3. Develop integrated plans to improve tools, methods, and interfaces for the advanced engineering of complex systems by appropriately infusing the products of the Intelligent Systems/Intelligent Synthesis Environment (IS/ISE) initiative into NASA engineering practices.
4. Partner with industry, academia, and other Government agencies to guide the development of broadly applicable standards and interoperable tools to enable AEE.
5. Advocate and facilitate technology transfer among industry, academia, and other Government agencies.

Objective D:

Provide value-added cross-Enterprise products and services that enable the infusion of technology, knowledge, and capabilities to support innovation in engineering and push the state of the art.

Initiatives:

1. Manage the Agency's Technical Standards Initiative to provide technical standards and tools for improving quality, interoperability, and consistency of engineering practices across NASA programs.
2. Manage the NASA Electronics Parts and Packaging (NEPP) Initiative for the assessment and dissemination to the NASA community the reliability of newly available Commercial-Off-The-Shelf (COTS) and advanced NEPP technologies for usage on NASA programs and projects through validations, assessments, characterizations, and development of test methods/tools.

Objective E:

Increase participation, membership, and leadership in recognized national and international engineering organizations.

Activities:

1. Develop an action plan for broad participation in the International Council on Systems Engineering at local, regional, and national levels.
2. Communicate broadly and promote the opportunities, requirements, and standards for membership in recognized national and international engineering organizations.

Metrics:

- A. Maintain an engineering workforce age and experience profile conducive to sustainability and long-term health of the capability.
- B. Measure progress in the formulation, implementation, and application of advanced tools and facilities metrics.
- C. Monitor improvements in agreed-upon capability maturity indicators, including software and systems engineering.
- D. Monitor improvements in NASA software initiative metrics.
- E. Monitor unmet scientific or technological goals and objectives as a result of deficiencies, significant anomalies or failures traceable to engineering.
- F. Provide accuracy, completeness, and end-to-end systems engineering expertise in programs and projects as demonstrated by independent review and assessment.
- G. Ensure feedback by program/project managers on the skill and overall capability of the engineering workforce.
- H. Participate in and impact national and international engineering organizations.
- I. Use the results derived from the NEPP initiative efforts in NASA's programs and projects across the Enterprises.
- J. Evaluate percentage of NASA-preferred technical standards identified in NASA's programs and projects.

V. Excellence in Program/Project Management

Goal:

To oversee and improve the PAPAC process for the effective formulation and implementation of Agency programs and projects in order to enhance the probability of successful missions.

Objective A:

To oversee the PAPAC process and report to the Administrator, the Program Management Council (PMC), the Office of Management and Budget, and to Congress on the success of the process. This objective is intended to support the accomplishment of NASA programs and projects, consistent with established Agency strategic planning.

Activities:

1. Participate in the PMC as a member and as the executive secretary to ensure that all programs and select projects undergo Agency-level scrutiny and status.
2. Oversee the quality and compliance of all Program Commitment Agreements (PCA) prior to the Administrator's signature; work with the Enterprises to ensure clarity, accuracy, and completeness; work with the Office of the Chief Scientist to define science requirements.
3. Regularly provide status to the PMC of PCA's, program plans, and project plans.

Initiatives:

1. Independent Program Assessment Office (IPAO), residing at the Langley Research Center; is to provide objective, independent review and assessment of NASA's programs and projects per NPG 7120.5 and the PCA.
2. The SMO at each Center is to assess programs, projects, and reports to the Center Director and the Center PMC.

Objective B:

To improve the PAPAC process.

Activities:

1. Provide requirements analysis and direction to the Program/Project Training Program which is implemented by the Training and Development Division.

2. Develop an appropriate in-house work policy to ensure that competency exists for program and project teams.
3. Evaluate, pilot and implement across the Agency new “tools” for program and project managers.
4. Benchmark high-tech, successful companies periodically to discover new ways to improve the process.
5. Team with the Department of Defense, the Federal Aviation Administration, and other Government agencies to make changes in the collective way the OCE works with the aerospace industry.

Initiatives:

- The Program Management Council Working Group (PMCWG) is established to develop and maintain the Agency's documents of reference in NPD 7120.4 and NPG 7120.5. The membership of this working group includes representatives from all of the Enterprises and the affected Functional Offices and the Directors of the Center's SMO.
- The Academy of Program/Project Leadership has been established to improve program/project managers across the Agency. Assignment of special studies for process improvement will be given to the PMCWG, such as assessment of the Centers' implementation of the process.
- Various program/project management tools will be evaluated, piloted and deployed across the Agency.

Metrics:

- A. Track and analyze compliance of the process, including PCA's, program plans, project plans, PMC and Governing PMC (GPMC) assessments.
- B. Increase the quality of PCA's, program and project plans.
- C. Measure customer satisfaction of technical and programmatic assessments.
- D. Increase the quality of the PMC and GPMC meetings.
- E. Meet with Headquarters representatives for process improvements.
- F. Process changes, resulting from assessments and improvement meetings.
- G. Process program/project changes, resulting from customer and assessment inputs.

- H. Measure the number of process changes, resulting from benchmarking trips.
- I. Ensure that competencies and core capability are affected by in-house projects to ensure that the projects are effective in developing program and project management skills.
- J. Measure the number of meetings with Government partners and the changes that resulted.
- K. Program and project managers are to complete training requirements.
- L. Track number/types of reviews and assessments of each program and project.
- M. Track actual vs. planned implementation of schedule and cost for each program identified.
- N. Track number, type, and cost of changes during implementation of identified program and projects.
- O. Track number and percentage of successful missions and mission requirements met.
- P. Identify percentage of total project cost spent in formulation vs. mission success.

VI. Effective Cross-Enterprise Decisionmaking

Goal:

To stimulate appropriate consideration of cost, risk, and safety in the process of making Agency decisions involving more than a single Enterprise.

Objective A:

Provide effective leadership of appropriate Agencywide activities.

Activities:

1. The Chief Engineer chairs the Space Transportation Council (STC). The STC provides advice, counsel, and recommendations for consideration by the Administrator relating to all aspects of space transportation investments related to NASA's flight and ground technology programs. The primary objectives of the STC are as follows:
 - Develop and guide the implementation of an overarching strategic investment plan that will ensure safe, reliable, lower cost access to space while enabling NASA's long-term strategic interests.

- Serve as a forum for establishing and reviewing Agency and international policies, practices, and issues related to space transportation requirements and technology development and establish and communicate budget requirements and an investment plan that guides space transportation technology development and system upgrades.
- Perform assessments and develop recommendations and processes for implementation approaches for NASA-wide programs that include, but are not limited to, the following areas:
 - Space transportation policies.
 - Space transportation capabilities and practices.
 - Budgets and priority recommendation for space transportation investment.
 - Coordination and integration of space transportation strategic planning.
 - Coordinate with other Federal agencies to develop requirements, assess roles and missions, and ensure proper coordination.

2. The Chief Engineer chairs the Space Operations Council (SOC). The SOC provides advice, counsel, and recommendations for consideration by the Administrator relating to space communications, mission control, and data processing. The primary objectives of the SOC are as follows:

- Establishes Agency-level space operations policies, plans, and standards.
- Approves NASA's space operation plans and conducts reviews of proposed major space operations investments required to accomplish these plans.
- Serves as the supporting panel for space operations and provides recommendations on proposed space operations investment to the Capital Investment Council.
- Evaluates and develops recommendations on specific space operations issues that are requested by the Administrator or Chief Engineer.

3. The Chief Engineer chairs the Core Capability Assessment Team. The team's objectives are to facilitate understanding of the deployment of the Agency's current personnel skill base, tools, and infrastructure facilities and to build a plan that aligns the future needs with Headquarters and Center competency areas, compatible with the NASA Strategic Plan. Team membership is comprised of representatives from the Enterprises and the Headquarters Functional Offices.

4. The Engineering Management Council (EMC) is chaired by the NASA Chief Engineer. The EMC's purpose is to provide advice, counsel, and recommendations for consideration by the Administrator relating to all aspects of engineering and its relationship to effective program and project management. Each NASA Center is represented in the EMC by the principal management official responsible for developing and maintaining the engineering capability that supports its mainstream programs and projects. The senior technical official or his/her designee represents the NASA Enterprises in the EMC. The JPL is an ex officio member of the Council.

5. In order to support the attainment of the Engineering Excellence goal, the OCE has chartered the following working groups.

- Systems Engineering Working Group (SEWG)

The SEWG is chaired by the Deputy Chief Engineer for Systems Engineering. The working group is comprised of a senior group of representative experts in discipline and/or systems engineering from the NASA Centers. In their SEWG role, they advise the EMC and the Agency on systems engineering matters and recommend management, engineering, and assurance policies, standards, best practices, and guidance.

- Software Working Group (SWG)

The SWG is chaired by the Assistant for NASA Software Initiative within the OCE. The working group is comprised of a senior group of representative experts in the discipline of software systems from the NASA Centers, the Office of the Chief Information Officer, OSMA, and the Enterprises. In their SWG role, they advise the EMC and the Agency on software-related matters and recommend software management, engineering, and assurance policies, standards, best practices, and guidance.

Metrics:

- A. Member satisfaction with decisions.
- B. Timely closure of actions resulting from meetings.
- C. Timely meetings in response to member requests.
- D. Timely issuance of minutes from meetings.